

CLAIMS

1. A semiconductor device manufacturing method comprising:
 - a first step of preparing a semiconductor substrate (11) on which multiple semiconductor devices are formed and thinning the semiconductor substrate (11);
 - 5 a second step of adhering a reinforcing member (13) through which a part of one surface of the semiconductor substrate (11) is exposed to the one surface thereof with an adhering material;
 - a third step of forming a metallic film (15) for forming an electrode provided in the semiconductor device on an exposed portion of one surface of the semiconductor
 - 10 substrate (11) or the other surface of the semiconductor substrate (11); and
 - a fourth step of removing the reinforcing member (13) from the semiconductor substrate (11) and dicing the semiconductor substrate (11); and
 - wherein the adhering member (13, 25) is formed of material which changes its state at temperature higher than a processing temperature in the third step.
- 15 2. The semiconductor device manufacturing method according to claim 1,
 - wherein the reinforcing member (13) has an opening at its center and a ring shape with an outer diameter equal to an outer diameter of the semiconductor substrate (11);
 - wherein the second step combines an outer periphery of the semiconductor substrate (11) with an outer periphery of the ring-shaped reinforcing member (13) to adhere the
 - 20 reinforcing member (13) to one surface of the semiconductor substrate (11) with the adhering material; and
 - wherein the third step forms the metallic film (15) on exposed one surface of the semiconductor substrate (11) through the opening of the ring-shaped reinforcing member (13).
- 25 3. The semiconductor device manufacturing method according to claim 1,
 - wherein the adhering material is formed of a metal or alloy having a melting point higher than a processing temperature in the third step or heat resistance resin having a melting

point or a softening point higher than the processing temperature in the third step.

4. The semiconductor device manufacturing method according to claim 3, wherein the heat resistance resin is polyimide resin.

5. The semiconductor device manufacturing method according to claim 3, wherein in the second step, the adhering material layer (14, 25) is formed on one surface of the ring-shaped reinforcing member (13), one surface of the ring-shaped reinforcing member (13) is placed on one surface of the semiconductor substrate (11) and the adhering material layer (14, 25) disposed between the ring-shaped reinforcing member (13) and the semiconductor substrate (11) is melted by heating, and the adhering material layer (14, 25) is hardened by cooling to adhere the ring-shaped reinforcing member (13) to the semiconductor substrate (11).

6. The semiconductor device manufacturing method according to claim 5, wherein in the first step, a first tape reinforcing member (12) is adhered to the other surface of the prepared semiconductor substrate (11) with an organic adhesive and one surface of the semiconductor substrate (11) is thinly processed in a state that the first tape reinforcing member (12) is adhered, thereby thinning the semiconductor substrate (11) up to a predetermined thickness;

wherein in the second step, the ring-shaped reinforcing member (13) is adhered to one surface of the semiconductor substrate with the adhering material layer (14) in a state that the first tape reinforcing member (12) is adhered to the other surface of the semiconductor substrate (11); and

wherein in the third step, the metallic film (15) is formed on one surface of the semiconductor substrate (11) through the opening of the ring-shaped reinforcing member (13) after removing the first reinforcing member (12) from the semiconductor substrate (11) in a state that the ring-shaped reinforcing member (13) is adhered to the semiconductor substrate (11).

7. The semiconductor device manufacturing method according to claim 6,

wherein the adhering material layer (14) has a melting point lower than heat resistance temperature of the first tape member (12).

8. The semiconductor device manufacturing method according to claim 6, wherein in the fourth step, a second tape reinforcing member (18) is adhered to the other
5 surface of the semiconductor substrate (11), the ring-shaped reinforcing member (13) is removed from one surface of the semiconductor substrate (11), and the semiconductor substrate (11) is diced into chips (22) that form the respective semiconductor devices.

9. The semiconductor device manufacturing method according to claim 8, wherein the adhering material layer (14) has a melting point lower than heat
10 resistance temperature of the second tape reinforcing member (18); and the adhering material layer (14) is melted by heating at temperature lower than heat resistance temperature of the second tape reinforcing member (18), thereby removing the ring-shaped reinforcing member (13) from the semiconductor substrate (11).

10. The semiconductor device manufacturing method according to claim 3,
15 wherein in the first step, a first tape reinforcing member (12) is adhered to the other surface of the prepared semiconductor substrate (11) with an organic adhesive and one surface of the semiconductor substrate (11) is thinly processed, thereby thinning the semiconductor substrate (11) up to a predetermined thickness; and

wherein in the second step, the semiconductor substrate (11) is fixed onto a stage
20 (24) having a heater and the semiconductor substrate (11) fixed onto the stage (24) is heated, thereby warpage caused on the semiconductor substrate (11) by a difference between a coefficient of linear expansion of the first tape reinforcing member (12) and a coefficient of linear expansion of the semiconductor substrate (11) is reduced.

11. A ring-shaped reinforcing member, which is used in a manufacturing process
25 of a semiconductor device having a semiconductor substrate (11) thinly processed to a predetermined thickness,

said reinforcing member having an opening at its center, having a ring shape with an

outer diameter equal to an outer diameter of the semiconductor substrate (11), and being adhered to one surface of the semiconductor substrate (11) with an adhering material, thereby enhancing strength of the semiconductor substrate (11) reduced by thinly processing.

5 12. The ring-shaped reinforcing member according to claim 11, wherein the ring-shaped reinforcing member has a thickness larger than a predetermined thickness of the thinly processed semiconductor device.

13. The ring-shaped reinforcing member according to claim 12, wherein the ring-shaped reinforcing member is formed of the same material as that of the
10 semiconductor substrate (11) and has a coefficient of linear expansion equal to that of the semiconductor substrate (11).